The Camden Cycle

Occupational Therapy Model

By LYNN CHESHIRE, M.A.O.T., S.R.O.T.

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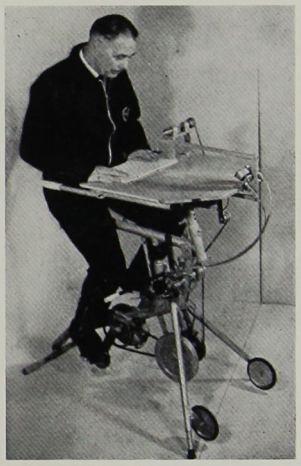

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INTRODUCTION

The Camden Cycle was originally designed for use in physiotherapy and, having proved its therapeutic value, was requested to be adapted as a sawing and sanding machine for use in occupational therapy.

Since that time it has been received with enthusiasm in several departments where it has undergone careful and intensive trials.

The tubular steel construction combines great strength with stability, and special attention has been paid to ease of adjustment using the minimum of tools.

The introduction of a hydraulic jack and a free-standing seat will be much appreciated by therapists, who have previously encountered difficulties when assisting patients to mount and dismount. During the trials it has been clearly demonstrated that this machine is a most advanced and satisfactory piece of occupational therapy equipment.

UNPACKING AND ASSEMBLY OF CYCLE

On receiving the Camden Cycle, and removing the crate, it will be found to consist of:—

1. The cycle.
2. The sanding attachment.
3. The sling back rest.

For the purposes of packing, it will have been adjusted to the position shown in Plate 1 and is not ready for use until readjusted to the position shown in Plate 2. This is effected by loosening nuts A and V (see diagram B on page 8) and manually raising the work table.

The sanding attachment Z, packed by screwing beneath the table, is fixed firmly in place with the allen key provided. (See page 18). The wooden packing piece behind the hydraulic jack should be removed.

The belting should be checked against the belting plan (see diagram A on page 7).

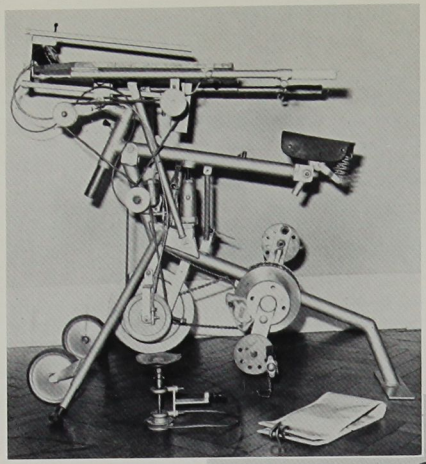


Plate 1

Cycle and Parts before assembly

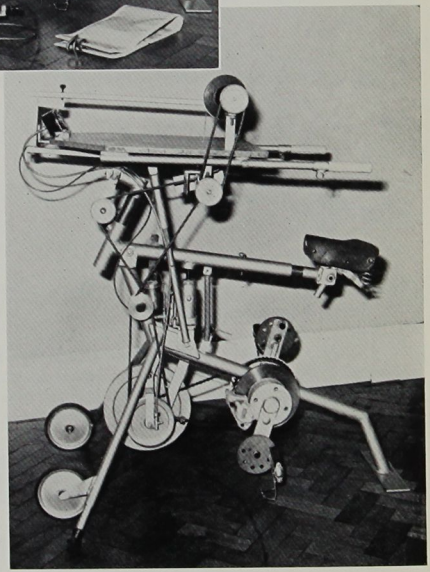


Plate 2

Cycle ready for use

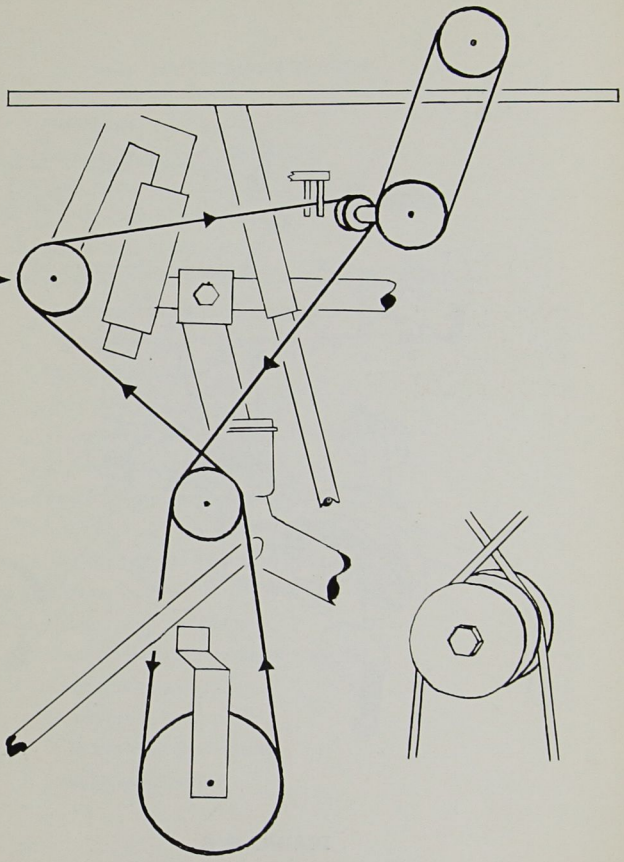


DIAGRAM A — BELTING PLAN

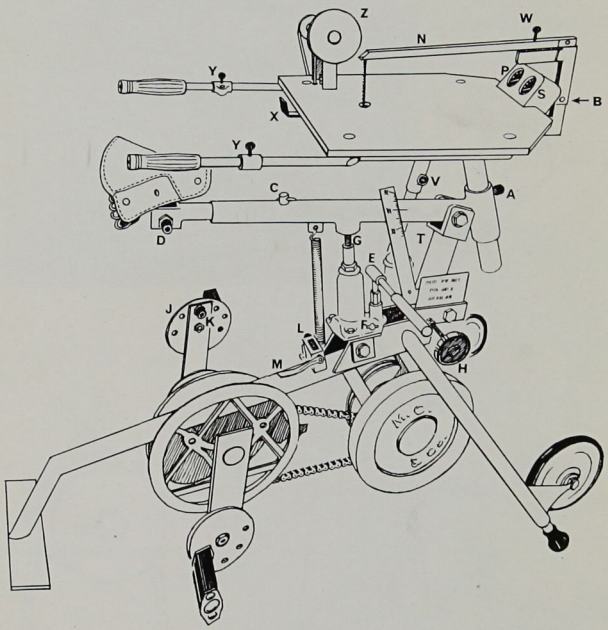


DIAGRAM B

ADJUSTMENT POINTS

No.	Description
A	Capstan knob (work table height)
B	Pivot point
C	Saddle reach adjustment peg
D	Saddle angle screw
E	Jack lever
F	Jack lowering peg
G	Central jack screw (for extra height)
H	Pressure hand wheel
J	Pedal disc
K	Thumb screw (crank length adjustment)
L	Revolution counter reset knob
M	Revolution counter striker arm
N	Lever arm
P	Speedometer and Milometer
S	Pressure Gauge
T	Saddle Height Indicator
V	Work table angle adjustment screw
W	Blade tension screw
X	Drive change lever
Y	Back rest sling attachments
Z	Sanding attachment

GENERAL DESCRIPTION

The cycle is basically a pyramidal construction of tubular steel and is therefore both strong and stable.

The saddle and work table are mounted on the same framework thus enabling the patient always to be in a comfortable position in relationship to his work. This framework pivots on the base to allow the various adjustments required for treatment.

The crossbar is supported by a hydraulic jack which controls the height of the saddle. This device enables the less agile patient to walk on to the saddle in the low position from where he can be easily raised to the required height by means of the lever provided. The saddle is lowered again by releasing the valve. The jack is capable of lowering and raising a weight of 600 lb.

Resistance is provided by means of a hydraulic disc brake and is applied to the caliper from a master cylinder by turning a hand wheel. The pressure gauge measures the resistance in lbs. and the Speedometer shows the speed in miles per hour.

The seat is of the saddle type to allow full range of movement at the hip.

A sling back rest which clips to the handlebars, is provided for the patient with impaired balance or lack of confidence.

Measurements are made possible by the following gauges:—

1. Revolution counter.
2. Speedometer.
3. Mileometer.
4. Resistance pressure gauge (brake).
5. Saddle height indicator.
6. Pedal crank adjustments are numbered.

Adjustments possible:—

1. Saddle height.
2. Saddle reach.
3. Saddle removal and replacement.
4. Saddle tilt.
5. Pedal crank length.
6. Work table height.
7. Handlebar height.
8. Back rest position.

Work possible:—

1. Fretsawing.
2. Sanding.
3. Buffing and polishing.

Mobility of machine

The whole cycle can be moved by one person. The back "leg" is gripped and raised so that the machine tilts forward on to its wheels, it can then be wheeled away or turned round (see plate 3).

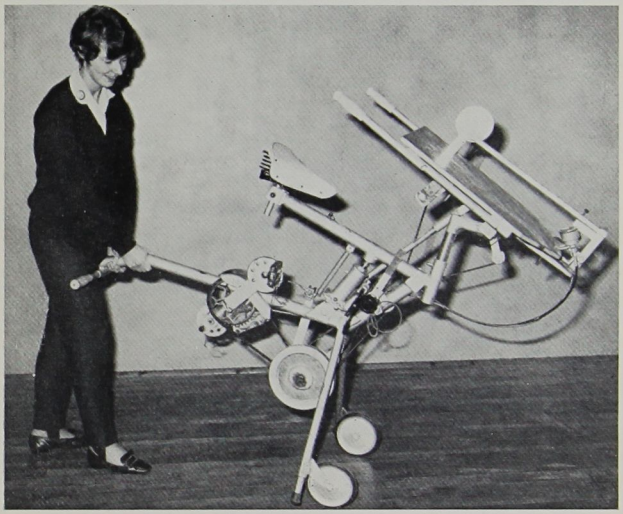


Plate 3

Method of moving the cycle

INSTRUCTIONS FOR OPERATION

To Raise Saddle (See Plate 4)

Insert jack lever (E) into socket on jacket and pump up and down.

To Lower Saddle (See Plate 5)

Withdraw lever from socket, slot lever over small peg (F) at base of jack barrel and turn anti-clockwise very slowly until the saddle begins to move. Rapid release of this valve must be avoided to prevent saddle dropping suddenly. Screw up again and return lever to its socket.

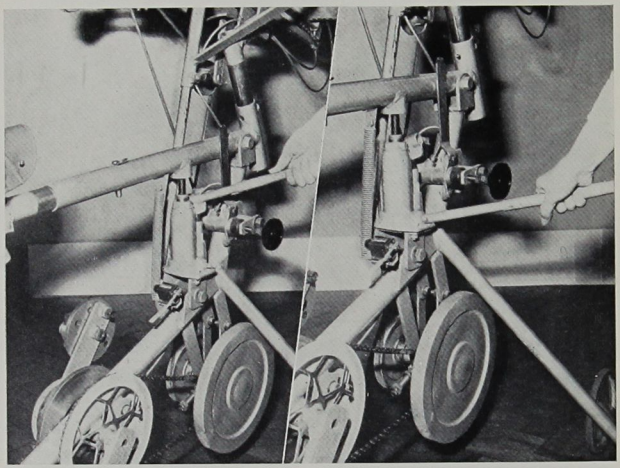


Plate 4
Operating hydraulic jack by pumping lever up and down

Plate 5
Releasing jack

Saddle Reach Adjustment

Withdraw peg (C) from crossbar and slide saddle backwards or forwards. Re-insert peg (C).

Work Table Height

Loosen capstan knobs (A) and (V) and raise the work table and handlebars manually. Re-tighten (A) and (V).

Pedal Crank Length (See Plate 6)

Unscrew black thumb screw (K) until it clears the disc (J) upon which the pedal is mounted. Rotate disc (J) (holding the disc *not* the pedal) until the desired hole is lined up with the thumb screw. Screw in fully. Both pedals should normally be set to the same length. The throw of the pedal is variable from 9 inches to 18 inches. (The normal bicycle has a 13 inch throw).

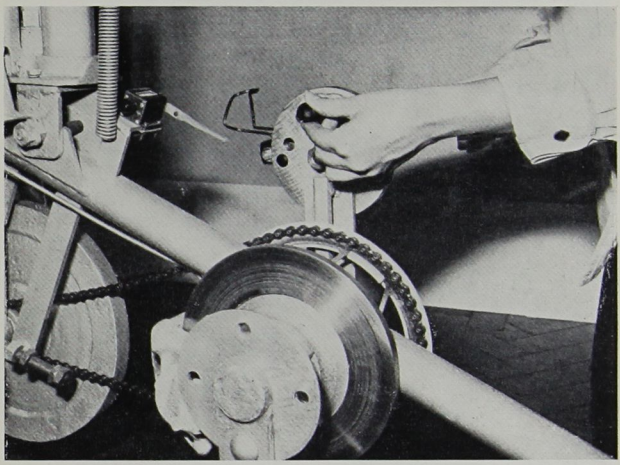


Plate 6

Adjustment of pedal crank length

Resistance to Pedalling (Plate 7)

Turn the pressure hand wheel (H) clockwise while watching the pressure gauge. NEVER EXCEED 70 lb. PRESSURE. If pressure is insufficient with hand wheel (H) screwed in, unscrew it six turns and start again.

To Reset Revolution Counter

Rotate small black knob (L) towards you.

To Move Cycle (See back Plate 3)

Pick up frame bar close to floor (*not* the saddle) and wheel into position.

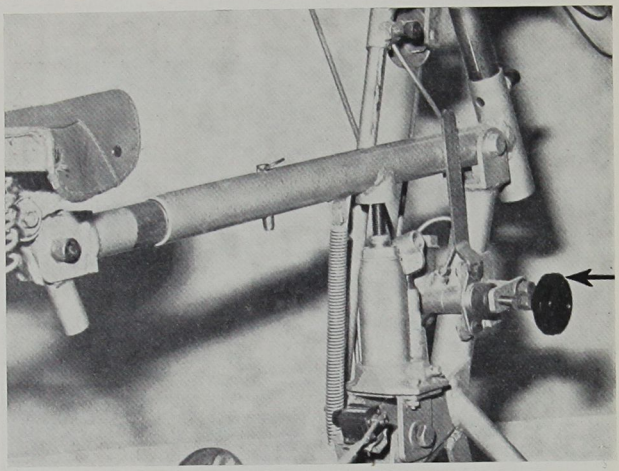


Plate 7

Pressure hand wheel

FURTHER ADJUSTMENTS

Saddle tilt is fixed and preset to the correct angle for most patients. It can be altered to accommodate exceptional height with the allen key provided. This is inserted in the screw (D) below the saddle. In the case of a patient having very limited abduction the saddle may be removed entirely by withdrawing saddle reach peg (C). The saddle can then be replaced behind the patient and peg (C) re-inserted. (See Plate 10).

Plate 8

Plate 9

Plate 10

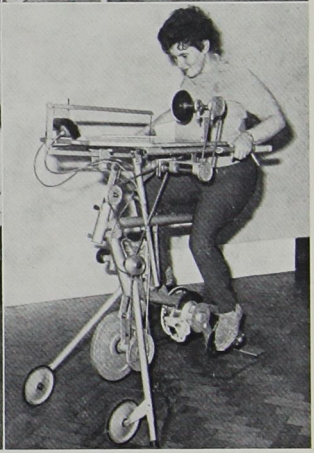


Plate 11

To show the removal and replacement of the saddle and the sequence of mounting the less agile patient on the cycle

Saddle Height

For all normal purposes the range of movement provided by the hydraulic jack should be sufficient, but this can be supplemented by operating a central screw (G). Lift the saddle against spring so that the top of jack comes out of its socket. For extra height — unscrew top of jack a little. To reduce height — screw top of jack in. Replace head of jack into its socket on the crossbar. For normal use about $1\frac{1}{2}$ inches of thread should be showing.

Note—The saddle should not be lifted manually, otherwise the head of the jack may come out of its socket. If this occurs, then the saddle should be again lifted manually and lowered whilst guiding the head of the jack back into its socket at (G).

Pedal Crank Adjustment Screw (K)

If this cannot be released by hand, a coin inserted in the slot will provide the necessary leverage.

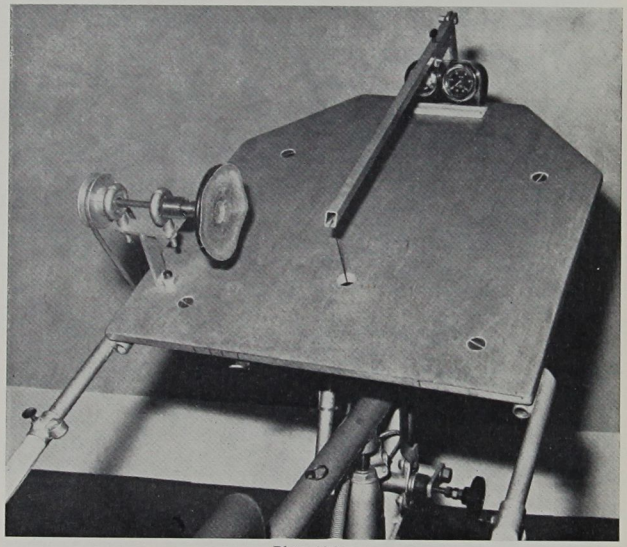


Plate 12A

The work table prepared for sawing or sanding

Revolution Counter (L)

The polythene striker arm (M) can be misaligned by a blow. It should be parallel to the frame tube. It should be realigned manually and allowed to return to its upward position and check that it is parallel to the frame tube.

PREPARATION FOR SAWING

Loosen thumb screw (W). Put lever arm (N) into the horizontal position. Insert coping saw blade at end of lever arm. Drop other end of blade through hole in table and insert into similar arm underneath table. (See Plate 12.)

The teeth should point towards the patient and downwards. Tighten thumbscrew (W) until the required tension is obtained.

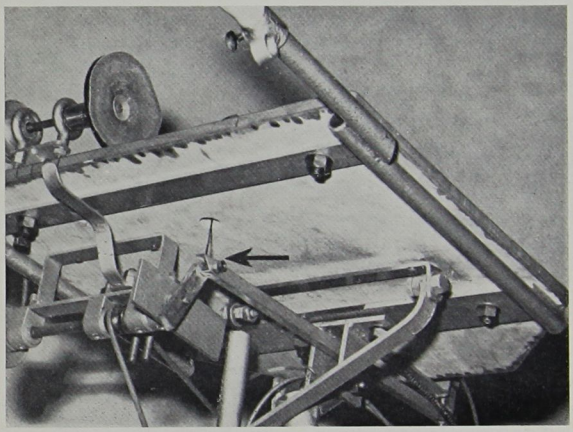


Plate 12

Insertion point for lower end of blade

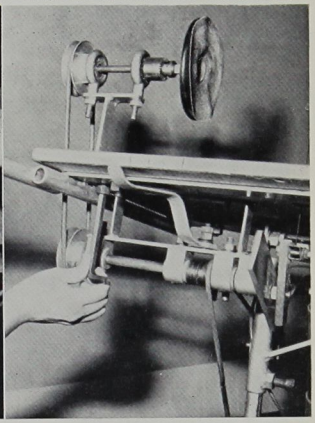
Move drive lever (X) sideways to engage drive belt (see Plate 13); it will engage more easily whilst pedalling. If the sanding attachment obstructs the patient's work it can be removed altogether by unscrewing the thumb screw on the underneath of the table, using the allen key provided (see Plate 14).

PREPARATION FOR SANDING

The sanding attachment should be fixed in the position shown in Plate 14. The fretsaw blade should be removed and the lever arm raised to the vertical position (see Plate 15). To engage the drive, move the drive lever (X) sideways whilst pedalling (Plate 13).

Buffing and Polishing can be used as alternatives to sanding by inserting the appropriate attachments in the chuck. (These are not provided with the cycle.)

Plate 14
Fixing sanding attachment with allen key



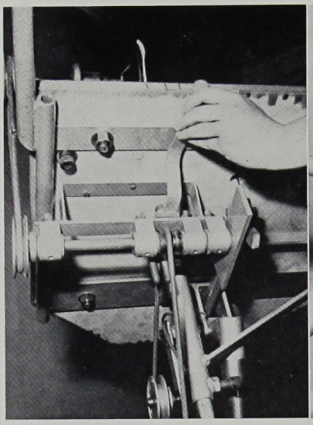


Plate 13
Operation of drive change lever

Plate 15
Patient sanding with lever arm raised to vertical position

TREATMENT NOTES

The special value of this therapeutic cycle lies in the following:—

1. The pattern of movement involved in pedalling is exactly similar to that required for walking and running.

2. Because the patient is sitting, his body weight is taken off his lower limbs. Thus:—
   (a) Reducing pressure within the joints and therefore allowing increased freedom of movement.
   (b) Permitting resistance to be accurately controlled solely by the adjustment of the machine.
   (c) Allowing movement in limbs which are too weak to take the full weight of the patient.

3. It offers controlled exercise for patients who are partial weight-bearing due to unconsolidated fractures, diseased or injured joints and muscles.

4. Where the disability is confined to one limb, the unaffected leg can assist the movements of the affected leg.

5. Due to the variety of adjustments, the full range of movement of all joints can be obtained.

MOBILISATION

Movements at the hip, knee and ankle can be obtained by the following adjustments of the cycle. However it must be borne in mind that these notes are intended only as a guide to the therapist, knowing that effective treatment depends initially on careful observation and assessment of the individual patient's therapeutic needs.

As a general rule, full extension of the knee and good extension of the hip are first sought in treatment, as the attainment of these movements will give the patient stability in walking and standing. Flexion of these joints is normally a secondary consideration but is most necessary in the hip if the patient is to be able to negotiate stairs and steps, and to sit comfortably.

Hip Joint

Flexion is obtained by:—

1. Lengthening pedal crank.
2. Lowering saddle.
3. Shortening saddle reach.

If work table is then found to be too high, it can be lowered by reversing the instructions in the section entitled "Unpacking and Assembly".

Plate 16
Full flexion of hip and knee and dorsi-flexion of the ankle

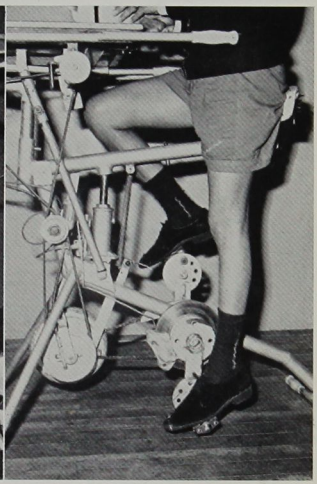


Plate 17
Full extension of hip and knee and plantar flexion of ankle

Extension by:—

1. Lengthening pedal crank.
2. Raising saddle.
3. Shortening saddle reach.

Fullest range by:—

1. Lengthening pedal crank.
2. Lowering saddle.
3. Lengthening saddle reach.

Knee Joint

Flexion is obtained by:—

1. Lengthening pedal crank.
2. Lowering saddle.
3. Shortening saddle reach.

Extension by:—

1. Lengthening pedal crank.
2. Raising saddle.
3. Lengthening saddle reach.

Fullest range by:—

1. Lengthening pedal crank.
2. Saddle mid-height.
3. Saddle reach — mid-position.

Ankle Joint

(N.B. Often difficult to avoid compensatory movements in other joints.)

Dorsi-flexion by:—

1. Lengthening pedal crank.
2. Lowering saddle.

Plantar-flexion by:—

1. Lengthening pedal crank.
2. Raising saddle.

INCREASE OF POWER

The amount of power which the patient must use can be graded by the amount of resistance applied. This is obtained by:—

1. Increasing the pressure of the brake. (This must not exceed 70 lb. on the pressure gauge.)
2. Sawing through harder, or thicker wood, plastic, etc.
   The cycle should be adjusted to ensure that the patient is using the muscles which require strengthening, and resistance is then applied.

N.B.—1. The Hip Extensors are particularly important to the above-knee amputee, as much of the usefulness of his artificial limb will depend upon the strength of these muscles.

2. The Plantar Flexors. Weakness of these muscles is one of the main causes of a limp because the patient then fails to rise on his toes. It is important that he pedals on the ball of his foot.

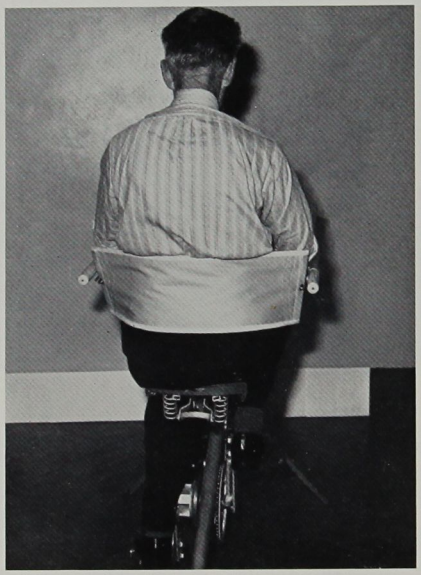


Plate 18

Patient with sling back rest in position

DISABILITIES

Disabilities which benefit particularly from treatment on the cycle:—

1. **Fractures of the lower limb** when partial or fully weight-bearing, for increase of joint range and muscle power.
2. **Rheumatoid arthritis, osteo-arthritis and similar diseases of the joints.** Body weight is removed from the joints and the movements of pedalling are smooth and rhythmical. All affected joints should be put through their full range of movement at least once a day.
3. **Amputees.** Valuable for all amputations of the lower limb. In early stages, it maintains muscle power and encourages circulation of the stump. In later stages it assists in the training of correct use of the prosthesis.

N.B.—Reference is particularly recommended to "An Approach to Occupational Therapy" by Mary S. Jones, which has excellent descriptions of the making and use of temporary working prostheses for attachment to the pedals.

The Back Rest (see Plate 18) provided is most valuable for those patients who lack balance and co-ordination, and for those whose loss of confidence is hindering treatment. It should not be used if the patient can safely manage without it.

METHOD OF RECORDING TREATMENT

The following form has been used in several departments. It records the date, resistance pressure in pounds, number of revolutions, treatment time, speed in m.p.h., crank length, saddle height and saddle reach. This provides an accurate record of the previous session and enables the therapist to re-set the controls as necessary.

Name .....

Aims of treatment.....

..... Joint range.....

Date	Pressure lb.	Revolutions	Time Mins.	Speed m.p.h.	Crank Length	Saddle Height	Saddle Reach	Comments

Resistance can be progressively increased as muscle power improves Increase in the number of revolutions in a given time indicates an improvement in endurance. Extension of the crank length and reduction of saddle height and reach are possible as joint range increases.

SUGGESTIONS FOR WORK

Jig-saws, Plywood shelving, partitions, etc.
Shelf brackets, Pelmet boards
Circular and shaped table tops
Plywood toys, e.g. rocking horse
Basketry bases, Cheese boards
Wooden spoons, salad sieves, (in preparation for carving)
Table mats
Preparation of discs for wood-turning, e.g. ashtrays
Cutting of plastics for splint-making
Templates

Suitable Materials (Ensure correct blade is used)

Deal, oak, beech
Plywood, chipboard, blockboard, hardboard
Laminated plastics, e.g. Formica
Plastics, e.g. Perspex; and for splint-making
Softer metals

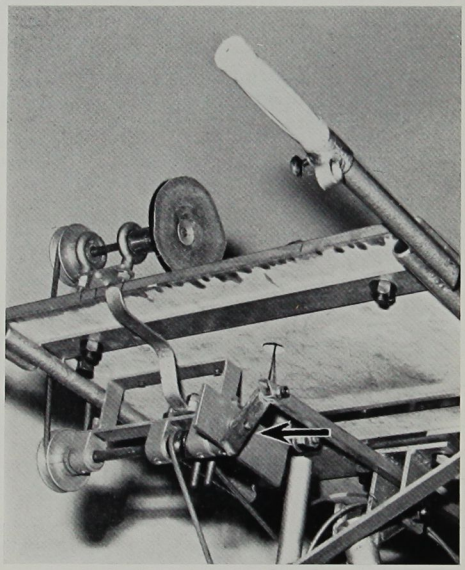


Plate 19
Wooden pitman

MAINTENANCE

Oiling Points (Arrowed on diagram)

Occasional oiling (lubricating oil) is required at the following points, all others being sealed and self-lubricating.

1. Saw frame at pivot point. Daily if in frequent use (B).
2. Wooden pitman under work table (see plate 19). Oil as necessary at both holes.
3. Belt tensioning pulley (see diagram of Belting Plan).

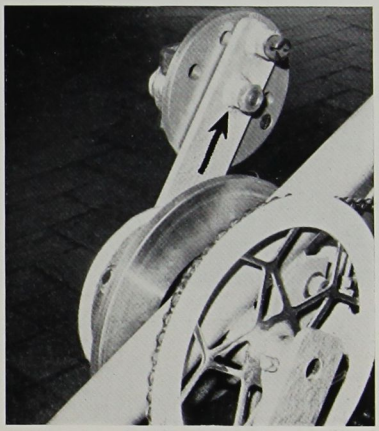


Plate 20
Nut on spindle

After extensive use:—

The cycle is a complex piece of machinery and, after extensive use, may require some adjustments:–

1. Pedal discs (J) may become slack. To correct tighten nuts on spindle (Plate 20).
2. Chain tension may become slack. Adjust tension by nut behind fly wheel (Plate 21). Screw up lock-nut.

REPLACEMENTS

1. Blades. Jig-saw Blades 6 in. Pinned ends, Fine, Medium, Coarse.
2. Sanding discs.
3. Drive belts. Main belt, and sanding belt.
   Obtainable from Nottingham Handcraft Company.

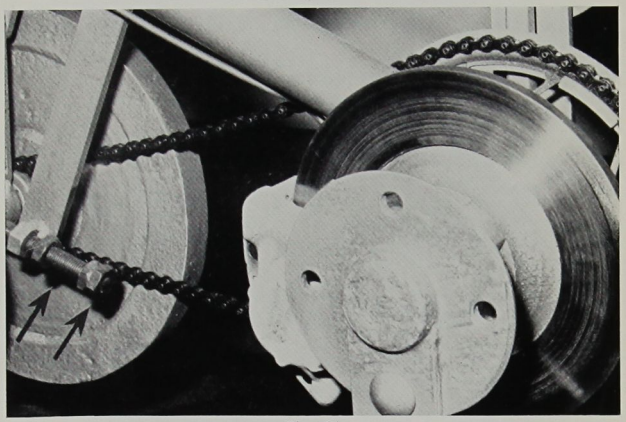


Plate 21

Showing chain tension adjustment point

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Larvic Rehabilitation Lathe
by D. E. Courtney, M.A.O.T.
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